

# LONDON- WEST MIDLANDS ENVIRONMENTAL STATEMENT

## Volume 5 | Technical Appendices

CFA10 | Dunsmore, Wendover and Halton

**Data appendix (LQ-001-010)**

Land quality

November 2013

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Department  
for Transport

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# 1 Introduction

1.1.1 The land quality appendix for the Dunsmore, Wendover and Halton community forum area (CFA10) comprises :

- a summary of engagement undertaken (Section 2);
- detailed risk assessment (Section 3);
- inspection notes and other site data (Section 4);
- geological sites of special scientific interest (SSSI) and local geological sites (LGS) (Section 5); and
- mining and minerals data (Section 6).

1.1.2 Maps referred to throughout the land quality appendix are contained in Maps LQ-01-019 to LQ-01-021 Volume 5, Land Quality Map Book.

## 2 Engagement

- 2.1.1 Table 1 sets out the local authorities and other organisations that have been engaged with during the preparation of the land quality section of the environmental impact assessment (EIA) for this study area, the types of information that have been provided to the assessment team and any specific concerns of those with whom the team engaged.

Table 1: Engagement on land quality issues undertaken for the Dunsmore, Wendover and Halton study area

| Local authority or other organisation     | Method/dates of contact   | Information provided and/or specific concerns   |
|---|---|---|
| Aylesbury Vale District Council<br>(AVDC) | Contact via email on:<br>28 November 2012;<br>10 December 2012; and<br>8 February 2013.<br>Contact via telephone on:<br>6 February 2013.  | AVDC supplied the requested data regarding locations of potentially contaminated land in a geographical information system (GIS) shapefile format within 1km of the route.  |
| Buckinghamshire County Council<br>(BuCC)  | Contact via email on:<br>28 November 2012;<br>3 December 2012;<br>21 December 2012;<br>2 January 2013;<br>23 January 2013;<br>1 February 2013;<br>9 February 2013; and<br>2 May 2013. | Initial email regarding detailed mineral areas for assessing sterilisation of resources and requesting landfill data to provide more detail on what has already been received to assess contamination potential.<br><br>BuCC responded with links to the Buckinghamshire County Council website.<br><br>BuCC also supplied GIS data showing preferred areas and landfill data and confirmed it does not have a designated petroleum officer or hold any information on underground storage tanks (UST). |
| Chiltern District Council<br>(ChDC)       | Contact via email on:<br>28 November 2012;<br>24 January 2013;<br>4 February 2013,<br>29 February 2013; and<br>10 May 2013.<br>Contact via telephone on:<br>2 May 2013.               | ChDC supplied requested information regarding sites that have potential land contamination, including GIS data and Part IIA <sup>1</sup> sites and are in the vicinity of the Proposed Scheme; information regarding UST on Hyde Heath Road was also provided.  |

<sup>1</sup> Environmental Protection Act 1990, Part IIA, London, Her Majesty's Stationary Office.

| Local authority or other organisation | Method/dates of contact  | Information provided and/or specific concerns   |
|---------------------------------------|--|---|
| Wycombe District Council<br>(WyDC)    | Contact via email on:<br>28 November 2012; and<br>4 December 2012.   | WyDC supplied requested mapping information (GIS shapefile format) regarding locations of potential contaminated land.  |
| Environment Agency                    | Contact via email on:<br>24 April 2013;<br>15 May 2013;<br>24 May 2013;<br>12 June 2013;<br>14 June 2013;<br>27 June 2013; and<br>8 June 2013. | The Environment Agency has been contacted to supply information on landfills within the study area - data outstanding at the time of production of this report. |



### 3 Detailed risk assessment

3.1.1 This section presents assessments for areas potentially posing a contaminative risk for the Proposed Scheme within the study area. For each site the following data are presented:

- baseline risk assessment;
- construction risk assessment;
- post-construction risk assessment; and
- assessment of temporary (construction) and permanent (post-construction) effects.

3.1.2 This risk assessment incorporates the following assumptions:

- construction workers are not included as part of this assessment;
- sites that have been assessed as potentially posing a contaminative risk to the Proposed Scheme have been grouped and considered together where appropriate. It should be noted that some parcels of land may have had several land uses from different epochs;
- during construction standard mitigation procedures will be in place in accordance with the draft Code of Construction Practice (CoCP) (Volume 5: Appendix CT-003-000); and
- during the post-construction condition it is assumed that all required remediation has been undertaken and validated.

3.1.3 The sites assessed in this study area are shown on the Maps LQ-01-019 to LQ-01-021 (Volume 5, Land Quality Map Book).

Table 2: Sites included in the detailed risk assessment within the Dunsmore, Wendover and Halton study area

| Area reference | Area name  | Table numbers |
|----------------|--|---------------|
| 10-1 and 10-13 | Existing Marylebone to Aylesbury line adjacent to route (including Wendover station) and historical railway spur | 3, 8, 13, 18  |
| 10-7           | Partially infilled pond  | 4, 9, 14, 19  |
| 10-9           | Petrol filling station and vehicle repair garage   | 5, 10, 15, 20 |
| 10-11          | Petrol filling station and tanks   | 6, 11, 16, 21 |
| 10-14          | Inert landfill adjacent to Bacombe Lane  | 7, 12, 17, 22 |

3.1.4 Contaminant types included within the risk assessments are based on the Priority Contaminants Report CLR 8<sup>2</sup>. Although withdrawn, this document is still commonly used and is considered good practice.

<sup>2</sup> Defra and Environment Agency, (2002), *Potential contaminants for the assessment of land- R&D Publication*, Bristol, Environment Agency.

3.1.5 The remainder of this section presents the risk assessment for the sites set out in Table 2. The following acronyms are used in these tables:

- CSM - conceptual site model; and
- VOC - volatile organic compounds.

### 3.1 Baseline risk assessment

Table 3: Baseline CSM and qualitative risk assessment – existing Marylebone to Aylesbury line adjacent to the route and historical railway spur (Wendover Station) (Area refs 10-1 and 10-13)

| Source  | Receptor  | Pathway  | Probability    | Consequence | Risk at baseline without mitigation |
|---|---|--|----------------|-------------|-------------------------------------|
| Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos.<br>Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling<br><br>Potential for landfilling on disused historical railway spur | Sensitive land use  | Direct contact, ingestion, inhalation of dusts and vapours from contaminated soils                 | Low likelihood | Moderate    | Moderate/low                        |
|   | Housing adjacent and within 50m (largely in Wendover)             |  |                |             |                                     |
|   | Commercial premises adjacent and within 50m (largely in Wendover) | Exposure by direct contact and ingestion of contaminated waters                                    | Unlikely       | Moderate    | Low                                 |
|   |   | Exposure to asphyxiative or explosive gases  | Unlikely       | Severe      | Moderate/low                        |
|   | Controlled waters   | Vertical and lateral migration of contaminated groundwater and through culverts                    | Likely         | Moderate    | Moderate                            |
|   | Principal Chalk aquifer at surface                                |  |                |             |                                     |
|   | Property  | Lateral migration and concentration of asphyxiative or explosive gases                             | Unlikely       | Severe      | Moderate/low                        |
|   | Housing adjacent and within 50m (largely in Wendover)             |  |                |             |                                     |
|   | Other commercial facilities within 50m                            | Direct contact of below ground building structures and services with contaminated groundwater/soil | Unlikely       | Negligible  | Very low                            |

Table 4: Baseline CSM and qualitative risk assessment – partially infilled pond (Area ref 10-7)

| Source  | Receptor  | Pathway   | Probability    | Consequence | Risk at baseline without mitigation |
|---|---|---|----------------|-------------|-------------------------------------|
| Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC) | Sensitive land use<br>Adjacent housing/employees (farm) | Inhalation/ingestion of or dermal contact with contaminated soils/dust  | Low likelihood | Moderate    | Moderate/low                        |
|   |   | Exposure of adjacent human receptors (residents) to contamination by direct contact and ingestion of contaminants in migrating contaminated water | Unlikely       | Moderate    | Low                                 |
|   |   | Exposure to asphyxiative or explosive gases   | Low likelihood | Severe      | Moderate                            |
|   | Property<br>Adjacent buildings (farm)                   | Lateral migration and concentration of asphyxiative or explosive gases  | Low likelihood | Severe      | Moderate                            |
|   |   | Direct contact of below ground building structures and services with contaminated groundwater/soil  | Unlikely       | Negligible  | Very low                            |

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Table 5: Baseline CSM and qualitative risk assessment – petrol filling station and vehicle repair garage (Area ref 10-9)

| Source  | Receptor  | Pathway  | Probability | Consequence | Risk at baseline without mitigation |
|---|---|--|-------------|-------------|-------------------------------------|
| Contaminants could include but not be restricted to petrol, diesel, chlorinated solvents, asbestos, oils and heavy metals | Sensitive land use<br>On-site employees<br>Adjacent housing             | Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust                   | Unlikely    | Moderate    | Low                                 |
|   |   | Inhalation of vapours derived from contaminated groundwater/soil                                   | Likely      | Moderate    | Moderate                            |
|   |   | Exposure to asphyxiative or explosive gases  | Likely      | Severe      | High                                |
|   | Controlled waters<br>Secondary undifferentiated head aquifer at surface | Vertical and lateral migration of contaminated groundwater   | Likely      | Minor       | Moderate/low                        |
|   | Property<br>Buildings on-site   | Concentration of asphyxiative or explosive gases/vapours   | Likely      | Severe      | High                                |
|   |   | Direct contact of below ground building structures and services with contaminated groundwater/soil | Likely      | Moderate    | Moderate                            |
|   | Property<br>Adjacent housing  | Lateral migration and concentration of asphyxiative or explosive gases/vapours                     | Likely      | Severe      | High                                |

| Source | Receptor | Pathway  | Probability    | Consequence | Risk at baseline without mitigation |
|--------|----------|--|----------------|-------------|-------------------------------------|
|        |          | Direct contact of below ground building structures and services with contaminated groundwater/soil | Low likelihood | Moderate    | Moderate/low                        |

Table 6: Baseline CSM and qualitative risk assessment – petrol filling station and tanks (Area ref 10-11)

| Source                                       | Receptor  | Pathway  | Probability | Consequence | Risk at baseline without mitigation |
|--|---|--|-------------|-------------|-------------------------------------|
| Contaminants could include petrol and diesel | Sensitive land use<br>On-site employees<br>Adjacent housing | Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust | Unlikely    | Moderate    | Low                                 |
|  |   | Inhalation of vapours derived from contaminated groundwater/soil                 | Likely      | Moderate    | Moderate                            |
|  |   | Exposure to asphyxiative or explosive gases                                      | Likely      | Severe      | High                                |
|  | Controlled waters<br>Principal Chalk aquifer at surface     | Vertical and lateral migration of contaminated groundwater                       | Likely      | Moderate    | Moderate                            |
|  | Property<br>Buildings on-site                               | Concentration of asphyxiative or explosive gases/vapours                         | Likely      | Severe      | High                                |
|  |   | Direct contact of below ground building structures                               | Likely      | Moderate    | Moderate                            |

| Source | Receptor                     | Pathway  | Probability    | Consequence | Risk at baseline without mitigation |
|--------|------------------------------|--|----------------|-------------|-------------------------------------|
|        |                              | and services with contaminated groundwater/soil  |                |             |                                     |
|        | Property<br>Adjacent housing | Lateral migration and concentration of asphyxiative or explosive gases/vapours                     | Likely         | Severe      | High                                |
|        |                              | Direct contact of below ground building structures and services with contaminated groundwater/soil | Low likelihood | Moderate    | Moderate/low                        |

Table 7: Baseline CSM and qualitative risk assessment – inert landfill adjacent to Bacombe Lane (Area ref 10-14)

| Source  | Receptor                                 | Pathway  | Probability | Consequence | Risk at baseline without mitigation |
|---|--|--|-------------|-------------|-------------------------------------|
| Recorded as an inert landfill (wastes which remain largely unaltered such as glass, concrete, bricks, tiles, soil and stones)<br><br>Contaminants unlikely unless unauthorised wastes were landfilled | Sensitive land use<br>Housing within 50m | Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust | Unlikely    | Moderate    | Low                                 |
|   |  | Inhalation of vapours derived from contaminated groundwater/soil                 | Unlikely    | Moderate    | Low                                 |
|   |  | Exposure to asphyxiative or explosive gases                                      | Unlikely    | Severe      | Moderate/low                        |
|   | Controlled waters                        | Vertical and lateral migration of contaminated                                   | Unlikely    | Minor       | Very low                            |

| Source | Receptor                           | Pathway  | Probability | Consequence | Risk at baseline without mitigation |
|--------|------------------------------------|--|-------------|-------------|-------------------------------------|
|        | Principal Chalk aquifer at surface | groundwater/leachate   |             |             |                                     |
|        | Property<br>Housing within 50m     | Lateral migration and concentration of asphyxiative or explosive gases                             | Unlikely    | Severe      | Moderate/low                        |
|        |                                    | Direct contact of below ground building structures and services with contaminated groundwater/soil | Unlikely    | Negligible  | Very low                            |



## 3.2 Construction risk assessment

Table 8: Construction CSM and qualitative risk assessment – existing Marylebone to Aylesbury line adjacent to the route (Wendover Station) and historical railway spur (Area refs 10-1 and 10-13)

| Source   | Receptor   | Pathway  | Probability    | Consequence | Risk with construction stage mitigation |
|--|--|--|----------------|-------------|---|
| Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling<br><br>Potential for landfilling on disused historical railway spur | Sensitive land use<br><br>Housing adjacent and within 50m (largely in Wendover)<br><br>Commercial premises adjacent and within 50m (largely in Wendover) | Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust                   | Low likelihood | Moderate    | Moderate/low                            |
|  |  | Inhalation of vapours derived from contaminated groundwater/soil                                   | Unlikely       | Moderate    | Low                                     |
|  |  | Exposure to asphyxiative or explosive gases  | Unlikely       | Severe      | Moderate/low                            |
|  | Controlled waters<br><br>Principal Chalk aquifer at surface  | Vertical and lateral migration of contaminated groundwater and through culverts                    | Likely         | Moderate    | Moderate                                |
|  | Property<br><br>Housing adjacent and within 50m (largely in Wendover)<br><br>Other commercial facilities within 50m                                      | Lateral migration and concentration of asphyxiative or explosive gases                             | Unlikely       | Severe      | Moderate/low                            |
|  |  | Direct contact of below ground building structures and services with contaminated groundwater/soil | Unlikely       | Negligible  | Very low                                |

Table 9: Construction CSM and qualitative risk assessment – partially infilled pond (Area ref 10-7)

| Source  | Receptor  | Pathway  | Probability    | Consequence | Risk with construction stage mitigation |
|---|---|--|----------------|-------------|---|
| Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC) | Sensitive land use<br><br>Adjacent housing/employees (farm) | Inhalation/ingestion of or dermal contact with contaminated soils/dust                             | Low likelihood | Moderate    | Moderate/low                            |
|   |   | Inhalation of vapours derived from contaminated groundwater/soil                                   | Unlikely       | Moderate    | Low                                     |
|   |   | Exposure to asphyxiative or explosive gases  | Low likelihood | Severe      | Moderate                                |
|   | Property<br><br>Adjacent building (farm)                    | Lateral migration and concentration of asphyxiative or explosive gases                             | Low likelihood | Severe      | Moderate                                |
|   |   | Direct contact of below ground building structures and services with contaminated groundwater/soil | Unlikely       | Negligible  | Very low                                |

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Table 10: Construction CSM and qualitative risk assessment – petrol filling station and vehicle repair garage (Area ref 10-9)

| Source  | Receptor  | Pathway  | Probability    | Consequence | Risk with construction stage mitigation |
|---|---|--|----------------|-------------|---|
| Contaminants could include but not be restricted to petrol, diesel, chlorinated solvents, asbestos, oils and heavy metals | Sensitive land use<br>On-site employees<br>Adjacent housing             | Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust                   | Unlikely       | Moderate    | Low                                     |
|   |   | Inhalation of vapours derived from contaminated groundwater/soil                                   | Likely         | Moderate    | Moderate                                |
|   |   | Exposure to asphyxiative or explosive gases  | Likely         | Severe      | High                                    |
|   | Controlled waters<br>Secondary undifferentiated head aquifer at surface | Vertical and lateral migration of contaminated groundwater   | Likely         | Minor       | Moderate/low                            |
|   | Property<br>Buildings on-site   | Concentration of asphyxiative or explosive gases/vapours   | Likely         | Severe      | High                                    |
|   |   | Direct contact of below ground building structures and services with contaminated groundwater/soil | Likely         | Moderate    | Moderate                                |
|   | Property<br>Adjacent housing  | Lateral migration and concentration of asphyxiative or explosive gases/vapours                     | Likely         | Severe      | High                                    |
|   |   | Direct contact of below ground building structures   | Low likelihood | Moderate    | Moderate/low                            |

| Source | Receptor | Pathway   | Probability | Consequence | Risk with construction stage mitigation |
|--------|----------|---|-------------|-------------|---|
|        |          | and services with contaminated groundwater/soil |             |             |   |

Table 11: Construction CSM and qualitative risk assessment – petrol filling station and tanks (Area ref 10-11)

| Source                                       | Receptor  | Pathway  | Probability | Consequence | Risk with construction stage mitigation |
|--|---|--|-------------|-------------|---|
| Contaminants could include petrol and diesel | Sensitive land use<br>On-site employees<br>Adjacent housing | Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust                   | Unlikely    | Moderate    | Low                                     |
|  |   | Inhalation of vapours derived from contaminated groundwater/soil                                   | Likely      | Moderate    | Moderate                                |
|  |   | Exposure to asphyxiative or explosive gases  | Likely      | Severe      | High                                    |
|  | Controlled waters<br>Principal Chalk aquifer at surface     | Vertical and lateral migration of contaminated groundwater   | Likely      | Moderate    | Moderate                                |
|  | Property<br>Buildings on-site                               | Concentration of asphyxiative or explosive gases/vapours   | Likely      | Severe      | High                                    |
|  |   | Direct contact of below ground building structures and services with contaminated groundwater/soil | Likely      | Moderate    | Moderate                                |
|  | Property  | Lateral migration and concentration of   | Likely      | Severe      | High                                    |

| Source | Receptor         | Pathway  | Probability    | Consequence | Risk with construction stage mitigation |
|--------|------------------|--|----------------|-------------|---|
|        | Adjacent housing | asphyxiative or explosive gases/vapours  |                |             |   |
|        |                  | Direct contact of below ground building structures and services with contaminated groundwater/soil | Low likelihood | Moderate    | Moderate/low                            |

Table 12: Construction CSM and qualitative risk assessment – inert landfill adjacent to Bacombe Lane (Area ref 10-14)

| Source  | Receptor  | Pathway  | Probability | Consequence | Risk with construction stage mitigation |
|---|---|--|-------------|-------------|---|
| Recorded as an inert landfill (wastes which remain largely unaltered such as glass, concrete, bricks, tiles, soil and stones)<br><br>Contaminants unlikely unless unauthorised wastes were landfilled | Sensitive land use<br><br>Housing within 50m                | Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust | Unlikely    | Moderate    | Low                                     |
|   |   | Inhalation of vapours derived from contaminated groundwater/soil                 | Unlikely    | Moderate    | Low                                     |
|   |   | Exposure to asphyxiative or explosive gases                                      | Unlikely    | Severe      | Moderate/low                            |
|   | Controlled waters<br><br>Principal Chalk aquifer at surface | Vertical and lateral migration of contaminated groundwater/leachate              | Unlikely    | Minor       | Very low                                |
|   | Property<br><br>Housing within 50m                          | Lateral migration and concentration of asphyxiative or explosive gases           | Unlikely    | Severe      | Moderate/low                            |

| Source | Receptor | Pathway  | Probability | Consequence | Risk with construction stage mitigation |
|--------|----------|--|-------------|-------------|---|
|        |          | Direct contact of below ground building structures and services with contaminated groundwater/soil | Unlikely    | Negligible  | Very low                                |

### 3.3 Post-construction risk assessment

Table 13: Post construction CSM and qualitative risk assessment – existing Marylebone to Aylesbury line adjacent to the route (Wendover Station) and historical railway spur (Area refs 10-1 and 10-13)

| Source   | Receptor   | Pathway  | Probability    | Consequence | Risk with permanent works mitigation |
|--|--|--|----------------|-------------|--------------------------------------|
| Residual contamination in made ground (e.g. ballast) including heavy metals, oils and asbestos. Low levels of ground gas (methane, carbon dioxide and VOC) in areas of potential landfilling<br><br>Potential for landfilling on disused historical railway spur | Sensitive land use<br><br>Housing adjacent and within 50m (largely in Wendover)<br><br>Commercial premises adjacent and within 50m (largely in Wendover) | Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust                   | Low likelihood | Moderate    | Moderate/low                         |
|  |  | Inhalation of vapours derived from contaminated groundwater/soil                                   | Unlikely       | Moderate    | Low                                  |
|  |  | Exposure to asphyxiative or explosive gases  | Unlikely       | Severe      | Moderate/low                         |
|  | Controlled waters<br><br>Principal Chalk aquifer at surface  | Vertical and lateral migration of contaminated groundwater and through culverts                    | Likely         | Moderate    | Moderate                             |
|  | Property<br><br>Housing adjacent and within 50m (largely in Wendover)  | Lateral migration and concentration of asphyxiative or explosive gases                             | Unlikely       | Severe      | Moderate/low                         |
|  | Other commercial facilities within 50m   | Direct contact of below ground building structures and services with contaminated groundwater/soil | Unlikely       | Negligible  | Very low                             |

Table 14: Post construction CSM and qualitative risk assessment – partially infilled pond (Area ref 10-7)

| Source  | Receptor  | Pathway  | Probability    | Consequence | Risk with permanent works mitigation |
|---|---|--|----------------|-------------|--------------------------------------|
| Assuming the site has been infilled with waste; contaminants that could be present include, but are not limited to: heavy metals, asbestos, organic compounds e.g. oils, inorganic compounds such as ammoniacal nitrogen and chloride, and ground gases (largely methane, carbon dioxide and VOC) | Sensitive land use<br>Adjacent housing/employees (farm) | Inhalation/ingestion of or dermal contact with contaminated soils/dust                             | Low likelihood | Moderate    | Moderate/low                         |
|   |   | Inhalation of vapours derived from contaminated groundwater/soil                                   | Unlikely       | Moderate    | Low                                  |
|   |   | Exposure to asphyxiative or explosive gases  | Low likelihood | Severe      | Moderate                             |
|   | Property<br>Adjacent building (farm)                    | Lateral migration and concentration of asphyxiative or explosive gases                             | Low likelihood | Severe      | Moderate                             |
|   |   | Direct contact of below ground building structures and services with contaminated groundwater/soil | Unlikely       | Negligible  | Very low                             |

Table 15: Post construction CSM and qualitative risk assessment – petrol filling station and vehicle repair garage (Area ref 10-9)

| Source  | Receptor           | Pathway   | Probability | Consequence | Risk with permanent works mitigation |
|---|--------------------|---|-------------|-------------|--------------------------------------|
| Contaminants could include but not be restricted to petrol, diesel, chlorinated solvents, asbestos, | Sensitive land use | Inhalation/ingestion of or dermal contact with windblown contaminated | Unlikely    | Moderate    | Low                                  |



| Source                | Receptor  | Pathway  | Probability    | Consequence | Risk with permanent works mitigation |
|-----------------------|---|--|----------------|-------------|--------------------------------------|
| oils and heavy metals | On-site employees<br>Adjacent housing                                   | soils/dust   |                |             |                                      |
|                       |   | Inhalation of vapours derived from contaminated groundwater/soil                                   | Likely         | Moderate    | Moderate                             |
|                       |   | Exposure to asphyxiative or explosive gases  | Likely         | Severe      | High                                 |
|                       | Controlled waters<br>Secondary undifferentiated head aquifer at surface | Vertical and lateral migration of contaminated groundwater   | Likely         | Minor       | Moderate/low                         |
|                       | Property<br>Buildings on-site   | Concentration of asphyxiative or explosive gases/vapours   | Likely         | Severe      | High                                 |
|                       |   | Direct contact of below ground building structures and services with contaminated groundwater/soil | Likely         | Moderate    | Moderate                             |
|                       | Property<br>Adjacent housing  | Lateral migration and concentration of asphyxiative or explosive gases/vapours                     | Likely         | Severe      | High                                 |
|                       |   | Direct contact of below ground building structures and services with contaminated groundwater/soil | Low likelihood | Moderate    | Moderate/low                         |

Table 16: Post construction CSM and qualitative risk assessment – petrol filling station and tanks (Area ref 10-11)

| Source                                       | Receptor   | Pathway  | Probability    | Consequence | Risk with permanent works mitigation |
|--|--|--|----------------|-------------|--------------------------------------|
| Contaminants could include petrol and diesel | Sensitive land use<br>Adjacent housing                   | Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust                   | Unlikely       | Moderate    | Low                                  |
|  |  | Inhalation of vapours derived from contaminated groundwater/soil                                   | Likely         | Moderate    | Moderate                             |
|  |  | Exposure to asphyxiative or explosive gases  | Likely         | Severe      | High                                 |
|  | Controlled waters<br>Principal Chalk aquifer at surface. | Vertical and lateral migration of contaminated groundwater   | Likely         | Moderate    | Moderate                             |
|  | Property<br>Buildings on-site                            | Concentration of asphyxiative or explosive gases/vapours   | Likely         | Severe      | High                                 |
|  |  | Direct contact of below ground building structures and services with contaminated groundwater/soil | Likely         | Moderate    | Moderate                             |
|  | Property<br>Adjacent housing                             | Lateral migration and concentration of asphyxiative or explosive gases/vapours                     | Likely         | Severe      | High                                 |
|  |  | Direct contact of below ground building structures and services with                               | Low likelihood | Moderate    | Moderate/low                         |

| Source | Receptor | Pathway                       | Probability | Consequence | Risk with permanent works mitigation |
|--------|----------|-------------------------------|-------------|-------------|--------------------------------------|
|        |          | contaminated groundwater/soil |             |             |                                      |

Table 17: Post construction CSM and qualitative risk assessment for – inert landfill adjacent to Bacombe Lane (Area ref 10-14)

| Source  | Receptor  | Pathway  | Probability | Consequence | Risk with permanent works mitigation |
|---|---|--|-------------|-------------|--------------------------------------|
| Recorded as an inert landfill (wastes which remain largely unaltered such as glass, concrete, bricks, tiles, soil and stones)<br><br>Contaminants unlikely unless unauthorised wastes were landfilled | Sensitive land use<br><br>Housing within 50m                | Inhalation/ingestion of or dermal contact with windblown contaminated soils/dust                   | Unlikely    | Moderate    | Low                                  |
|   |   | Inhalation of vapours derived from contaminated groundwater/soil                                   | Unlikely    | Moderate    | Low                                  |
|   |   | Exposure to asphyxiative or explosive gases  | Unlikely    | Severe      | Moderate/low                         |
|   | Controlled waters<br><br>Principal Chalk aquifer at surface | Vertical and lateral migration of contaminated groundwater/leachate                                | Unlikely    | Minor       | Very low                             |
|   | Property<br><br>Housing within 50m                          | Lateral migration and concentration of asphyxiative or explosive gases                             | Unlikely    | Severe      | Moderate/low                         |
|   |   | Direct contact of below ground building structures and services with contaminated groundwater/soil | Unlikely    | Negligible  | Very low                             |

### 3.4 Assessment of temporary (construction) and permanent (post-construction) effects

Table 18: Significance of impact during construction and post construction – existing Marylebone to Aylesbury line adjacent to the route (Wendover Station) and historical railway spur (Area refs 10-1 and 10-13)

| Contaminant linkage  | Baseline risk | Construction risk | Post-construction risk | Construction significance | Post-construction significance |
|--|---------------|-------------------|------------------------|---------------------------|--------------------------------|
| Inhalation/ingestion/dermal contact of contaminated soils/dusts by adjacent residents and commercial employees | Moderate/low  | Moderate/low      | Moderate/low           | Negligible                | Negligible                     |
| Inhalation of vapours derived from contaminated groundwater/soil by adjacent residents and employees           | Low           | Low               | Low                    | Negligible                | Negligible                     |
| Exposure to asphyxiative or explosive gases by adjacent residents and employees                                | Moderate/low  | Moderate/low      | Moderate/low           | Negligible                | Negligible                     |
| Vertical and lateral migration of contaminated groundwater into the Principal Chalk aquifer                    | Moderate      | Moderate          | Moderate               | Negligible                | Negligible                     |
| Lateral migration and concentration of asphyxiative or explosive gases in adjacent housing                     | Moderate/low  | Moderate/low      | Moderate/low           | Negligible                | Negligible                     |
| Direct contact of below ground building structures and services on-site with contaminated groundwater/soil     | Very low      | Very low          | Very low               | Negligible                | Negligible                     |
| Overall significance   |               |                   |                        | Negligible                | Negligible                     |

Table 19: Significance of impact during construction and post construction – partially infilled pond (Area ref 10-7)

| Contaminant linkage  | Baseline risk | Construction risk | Post-construction risk | Construction significance | Post-construction significance |
|--|---------------|-------------------|------------------------|---------------------------|--------------------------------|
| Inhalation/ingestion/dermal contact of contaminated soils/dusts by adjacent residents/employees  | Moderate/low  | Moderate/low      | Moderate/low           | Negligible                | Negligible                     |
| Inhalation of vapours derived from contaminated groundwater/soil by adjacent residents/employees | Low           | Low               | Low                    | Negligible                | Negligible                     |

| Contaminant linkage   | Baseline risk | Construction risk | Post-construction risk | Construction significance | Post-construction significance |
|---|---------------|-------------------|------------------------|---------------------------|--------------------------------|
| Exposure to asphyxiative or explosive gases by adjacent residents/employees                                 | Moderate      | Moderate          | Moderate               | Negligible                | Negligible                     |
| Lateral migration and concentration of asphyxiative or explosive gases in adjacent housing                  | Moderate      | Moderate          | Moderate               | Negligible                | Negligible                     |
| Direct contact of adjacent below ground building structures and services with contaminated groundwater/soil | Very low      | Very low          | Very low               | Negligible                | Negligible                     |
| Overall significance  |               |                   |                        | Negligible                | Negligible                     |

Table 20: Significance of impact during construction and post construction – petrol filling station and vehicle repair garage (Area ref 10-9)

| Contaminant linkage  | Baseline risk | Construction risk | Post-construction risk | Construction significance | Post-construction significance |
|--|---------------|-------------------|------------------------|---------------------------|--------------------------------|
| Inhalation/ingestion/dermal contact of contaminated soils/dusts by on-site employees and adjacent residents            | Low           | Low               | Low                    | Negligible                | Negligible                     |
| Inhalation of vapours derived from contaminated groundwater/soil by on-site employees and adjacent residents           | Moderate      | Moderate          | Moderate               | Negligible                | Negligible                     |
| Exposure to asphyxiative or explosive gases by on-site employees and adjacent residents                                | High          | High              | High                   | Negligible                | Negligible                     |
| Concentration of asphyxiative or explosive gases in on-site buildings  | High          | High              | High                   | Negligible                | Negligible                     |
| Vertical and lateral migration of contaminated groundwater into the Secondary undifferentiated head aquifer at surface | Moderate/low  | Moderate/low      | Moderate/low           | Negligible                | Negligible                     |
| Direct contact of below ground building structures and services on-site with contaminated groundwater/soil             | Moderate      | Moderate          | Moderate               | Negligible                | Negligible                     |

| Contaminant linkage   | Baseline risk | Construction risk | Post-construction risk | Construction significance | Post-construction significance |
|---|---------------|-------------------|------------------------|---------------------------|--------------------------------|
| Lateral migration and concentration of asphyxiative or explosive gases in adjacent housing                  | High          | High              | High                   | Negligible                | Negligible                     |
| Direct contact of adjacent below ground building structures and services with contaminated groundwater/soil | Moderate/low  | Moderate/low      | Moderate/low           | Negligible                | Negligible                     |
| Overall significance  |               |                   |                        | Negligible                | Negligible                     |

Table 21: Significance of impact during construction and post construction – petrol filling station and tanks (Area ref 10-11)

| Contaminant linkage  | Baseline risk | Construction risk | Post-construction risk | Construction significance | Post-construction significance |
|--|---------------|-------------------|------------------------|---------------------------|--------------------------------|
| Inhalation/ingestion/dermal contact of contaminated soils/dusts by on-site employees and adjacent residents  | Low           | Low               | Low                    | Negligible                | Negligible                     |
| Inhalation of vapours derived from contaminated groundwater/soil by on-site employees and adjacent residents | Moderate      | Moderate          | Moderate               | Negligible                | Negligible                     |
| Exposure to asphyxiative or explosive gases by on-site employees and adjacent residents                      | High          | High              | High                   | Negligible                | Negligible                     |
| Vertical and lateral migration of contaminated groundwater into the Principal Chalk aquifer at surface       | Moderate      | Moderate          | Moderate               | Negligible                | Negligible                     |
| Concentration of asphyxiative or explosive gases in on-site buildings  | High          | High              | High                   | Negligible                | Negligible                     |
| Direct contact of below ground building structures and services on-site with contaminated groundwater/soil   | Moderate      | Moderate          | Moderate               | Negligible                | Negligible                     |
| Lateral migration and concentration of asphyxiative or explosive gases in adjacent housing                   | High          | High              | High                   | Negligible                | Negligible                     |
| Direct contact of adjacent below ground building   | Moderate/low  | Moderate/low      | Moderate/low           | Negligible                | Negligible                     |

| Contaminant linkage  | Baseline risk | Construction risk | Post-construction risk | Construction significance | Post-construction significance |
|--|---------------|-------------------|------------------------|---------------------------|--------------------------------|
| structures and services with contaminated groundwater/soil |               |                   |                        |                           |                                |
| Overall significance                                       |               |                   |                        | Negligible                | Negligible                     |

Table 22: Significance of impact during construction and post construction – inert landfill adjacent to Bacombe Lane (Area ref 10-14)

| Contaminant linkage   | Baseline risk | Construction risk | Post-construction risk | Construction significance | Post-construction significance |
|---|---------------|-------------------|------------------------|---------------------------|--------------------------------|
| Inhalation/ingestion/dermal contact of contaminated soils/dusts by residents within 50m                         | Low           | Low               | Low                    | Negligible                | Negligible                     |
| Inhalation of vapours derived from contaminated groundwater/soil by residents within 50m                        | Low           | Low               | Low                    | Negligible                | Negligible                     |
| Exposure to asphyxiative or explosive gases by residents within 50m   | Moderate/low  | Moderate/low      | Moderate/low           | Negligible                | Negligible                     |
| Vertical and lateral migration of contaminated groundwater/leachate into the Principal Chalk aquifer at surface | Very low      | Very low          | Very low               | Negligible                | Negligible                     |
| Lateral migration and concentration of asphyxiative or explosive gases in housing within 50m                    | Moderate/low  | Moderate/low      | Moderate/low           | Negligible                | Negligible                     |
| Direct contact of below ground building structures and services within 50m with contaminated groundwater/soil   | Very low      | Very low          | Very low               | Negligible                | Negligible                     |
| Overall significance  |               |                   |                        | Negligible                | Negligible                     |

## **4 Inspections notes and other site data**

- 4.1.1 There were no site visits carried out due to access constraints and no additional site data have been identified.



## **5 Geological sites of special scientific interest and local geological sites**

5.1.1 There are no geo-conservation resources identified within the study area.

## 6 Mining and minerals data

- 6.1.1 The Buckinghamshire Minerals and Waste Core Strategy development plan document<sup>3</sup>, confirms that the route will not pass through any MSA, mineral consultation areas or sites of current extraction.
- 6.1.2 Wendover Gravel Pit and Bacombe Hill have been identified as locations where historical sand and gravel extraction has taken place.
- 6.1.3 Bacombe Hill has also been identified on historical maps as the site of an old chalk pit in 1961 as shown in Map LQ-01-19 (Volume 5, Land Quality Map Book).

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<sup>3</sup> Buckinghamshire County Council, (2011), *Minerals and Waste Core Strategy*, adopted November 2012.

## 7 References

Buckinghamshire County Council, (2011), *Minerals and Waste Core Strategy*, adopted November 2012.

Defra and Environment Agency, (2002), *Potential contaminants for the assessment of land - R&D Publication*, Bristol, Environment Agency.

*Environmental Protection Act 1990*, Part IIA, introduced in England on 1 April 2000, London, Her Majesty's Stationery Office.